

CLAIMS

1. A system for the transportation and storage of a product, which system comprises:
- 5 (a) a tank including cylindrical wall section and two ends, wherein the cylindrical wall section and two ends define a cylindrical tank periphery, and wherein the tank periphery has an interior and an exterior;
- (b) a valve box including one or more side walls, a bottom wall, and a removable, sealable top cover which can be attached to the one or more side walls to seal the valve box, wherein the valve box side walls are sealably joined
- 10 to the cylindrical wall;
- (c) one or more process valves disposed in the valve box, wherein each valve has a first and a second end, wherein each first end is connected to a pipe which passes through a wall of the valve box for introducing product into the tank or withdrawing product from the tank; and
- 15 (d) a purge valve and pressure measurement means in fluid communication with the valve box;
- wherein the product in the tank is isolated from the atmosphere surrounding the tank when the valve box is sealed.
- 20 2. The system of Claim 1 wherein the valve box is at least partially recessed and is at least partially disposed in the interior of the tank periphery, and wherein the valve box cover, when attached to the one or more side walls of the valve box to form a sealed valve box, is disposed at the tank periphery or is exterior to the tank periphery.
- 25 3. The system of Claim 2 wherein the sealed valve box is isolated from the atmosphere surrounding the tank.
4. The system of Claim 1 which further comprises temperature measurement means for determining the temperature in the valve box.
- 30 5. The system of Claim 1 wherein the valve box is cylindrical and has a circular bottom wall, a circular top cover, and a cylindrical center portion forming a single side wall.

6. The system of Claim 1 wherein the purge valve is connected to a sealable closure which can be connected to a fill line for introducing purge gas into the valve box.
7. The system of Claim 6 wherein the maximum allowable working pressure of the valve box when sealed is equal to or greater than the maximum allowable working pressure of the tank.
8. The system of Claim 1 wherein each second end of the one or more process valves is connected to a sealable closure which can be connected to a fill line for introducing product into the tank from an external source, connected to a withdrawal line for withdrawing product from the tank for external use, or sealed closed for transportation or storage of the product in the tank.
9. The system of Claim 8 wherein each sealable closure is disposed in the valve box and within the tank periphery.
10. The system of Claim 8 wherein the tank contains product in coexisting liquid and vapor phases, wherein a fill line is adapted for introducing liquid into the tank and a withdrawal line is adapted for withdrawing vapor from the tank.
11. The system of Claim 10 wherein the tank contains a product selected from the group consisting of ammonia, chlorine, hydrogen chloride, trichlorosilane, silicon tetrachloride, and methyltrichlorosilane.
12. The system of Claim 8 wherein the tank contains a solid particulate component and gas, wherein the fill line is adapted for introducing a mixture of the solid particulate component and gas into the tank and the withdrawal line is adapted for withdrawing a mixture of the solid particulate component and gas from the tank.
13. The system of Claim 8 wherein the tank contains a slurry of a solid particulate component and a liquid component, wherein the fill line is adapted for introducing a slurry of the solid particulate component and the liquid component into the tank and the withdrawal line is adapted for withdrawing a slurry of the solid particulate component and the liquid from the tank.

14. The system of Claim 1 wherein the axis of the tank is generally horizontal, the tank has a top and a bottom, the valve box is disposed in the top of the tank, and a pipe connected to the first end of a valve forms a dip tube which extends through and
5 downward from the valve box to a location adjacent the bottom of the tank.

15. The system of Claim 1 which further comprises a rigid framework surrounding the tank and valve box, wherein the framework is attached to and supports the tank, and wherein the framework defines a periphery which encloses the periphery of the tank.
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16. The system of Claim 11 wherein the valve box is disposed within the periphery of the rigid framework.

17. The system of Claim 1 which further comprises analytical means for analyzing fluid withdrawn from the valve box when the valve box is sealed or for analyzing fluid in situ in the valve box when the valve box is sealed.
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18. A method for the transportation of a product, which method comprises:

(a) providing a system which comprises

20 (1) a tank including a cylindrical wall section and two ends, wherein the cylindrical wall section and two ends define a cylindrical tank periphery, and wherein the periphery has an interior and an exterior;

(2) a valve box including one or more side walls, a bottom wall, and a removable and sealable top cover which can be attached to the one
25 or more side walls to form a sealed valve box, wherein the valve box side walls are sealably joined to the cylindrical wall section;

(3) one or more process valves disposed in the valve box, wherein each valve has a first and a second end, wherein each first end is connected to a pipe which passes through a wall of the valve box for
30 introducing product into the tank or withdrawing product from the tank, and wherein product in the tank is isolated from the atmosphere surrounding the tank when the valve box is sealed; and

(4) a purge valve and pressure measurement means in fluid communication with the valve box;

(b) introducing product into the tank through at least one of the one or more process valves, through a pipe connected to the first end of the process valve, which pipe passes through the wall of the valve box and into the tank;

5 (c) closing the one or more process valves, thereby isolating the product in the tank at a product pressure, and attaching the sealable top cover to the one or more side walls of the valve box;

10 (d) at a first time, purging the valve box with a purge gas, pressurizing the valve box to a pressure between the product pressure and atmospheric pressure, closing the purge valve, and measuring and recording the pressure in the valve box; and

(e) at a second time later than the first time, measuring the pressure in the valve box and comparing the pressure at the second time to the pressure in the valve box measured in (d) at the first time.

15 19. The method of Claim 18 wherein the system further comprises a rigid framework surrounding the tank and valve box, wherein the framework is attached to and supports the tank, and wherein the framework defines a periphery which encloses the periphery of the tank.

20 20. The method of Claim 19 wherein the valve box is disposed within the periphery of the rigid framework.

25 21. The method of Claim 18 which further comprises transporting the system from a first location to a second location during a time period between the first time and the second time.

30 22. The method of Claim 21 which further comprises measuring the temperature in the valve box at the first and second locations, correcting the pressure at the second location to yield a temperature-corrected pressure at the second location, and comparing the temperature-corrected pressure at the second location with the pressure measured at the first location.

23. The method of Claim 22 wherein when the temperature-corrected pressure in the valve box at the second location is greater than the pressure measured in the valve box at the first location, transporting the system from the second location to the first location.

5 24. The method of Claim 22 wherein when the temperature-corrected pressure in the valve box at the second location is less than the pressure measured in the valve box at the first location, analyzing the fluid in the valve box, and if the fluid in the valve box contains product, transporting the system from the second location to the first location.

10 25. The method of Claim 22 wherein when the temperature-corrected pressure in the valve box at the second location is essentially equal to the pressure measured in the valve box at the first location, analyzing the fluid in the valve box, and if the fluid in the valve box contains product, transporting the system from the second location to the first location.

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